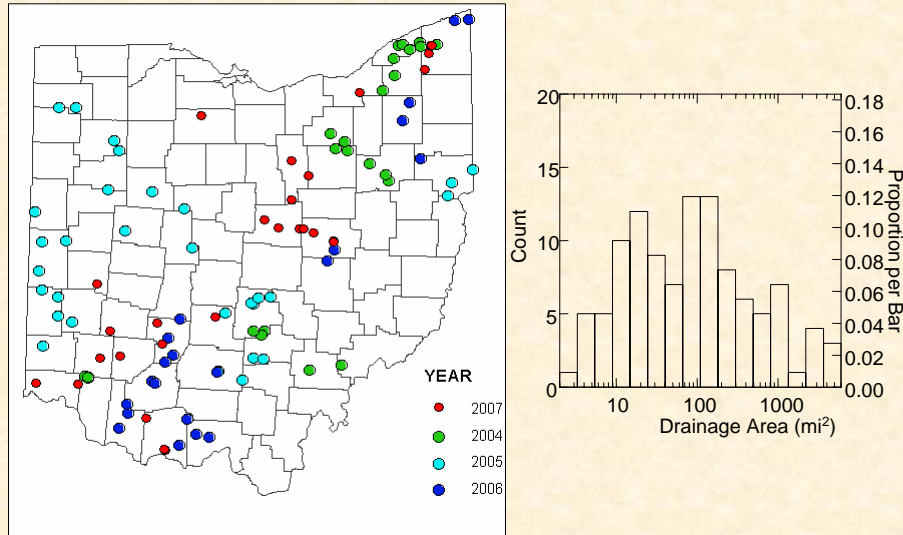




Study Overview

- Four-year Study of Small Rivers and Streams
 - **109** benthic chlorophyll a, water column nutrients, canopy cover, land use, physical measures (drainage area, gradient, physical habitat quality)
 - **100** fish samples
 - **96** macroinvertebrate samples (55 quantitative)
 - **86** dissolved oxygen (hourly observations 24-48 h)
 - 77 minimum cell size between hourly D.O. and macroinvertebrates

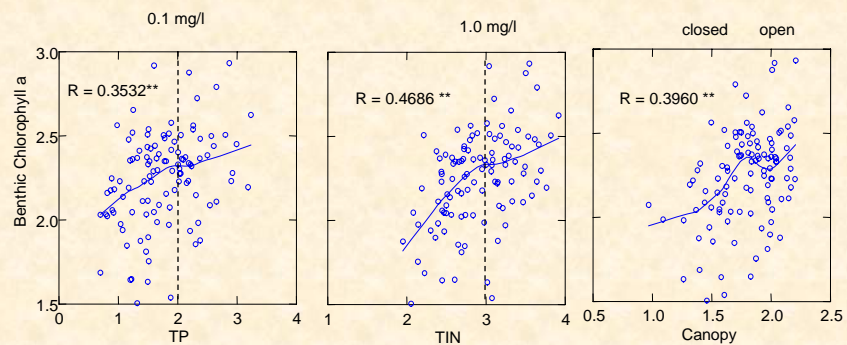
Geographic Scope and Size Distribution of Study Sites



Lines of Evidence

- Relationship Between Nutrients and Productivity
 - Benthic Chlorophyll = TP + TIN
 - Other Factors: Light, Scour, Drainage area, Gradient
 - scour “controlled” by sampling 10 d post flood event
- Relationship Between Productivity and Biological Condition
 - Trophic
 - Shifts in Community Composition
 - Indirect
 - Dissolved Oxygen Regime

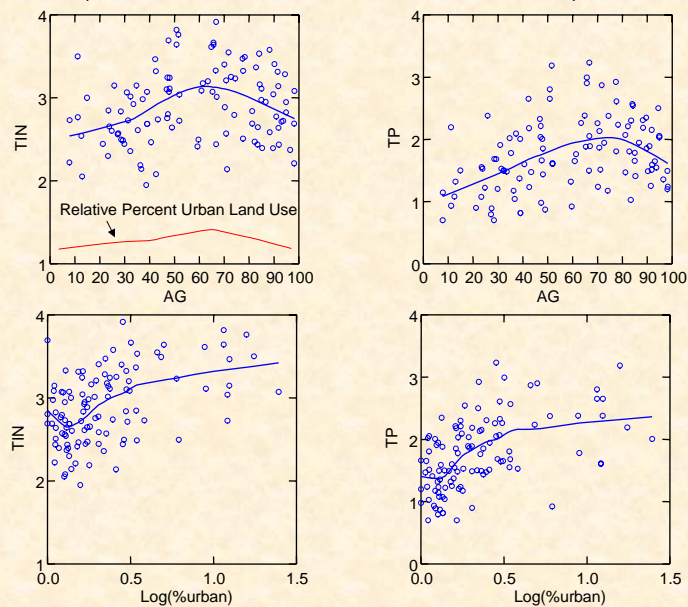
Relationship Between Benthic Chlorophyll a, Nutrients & Light



** Pearson correlation significant at the $P < 0.01$ level

Land Use and Nutrients

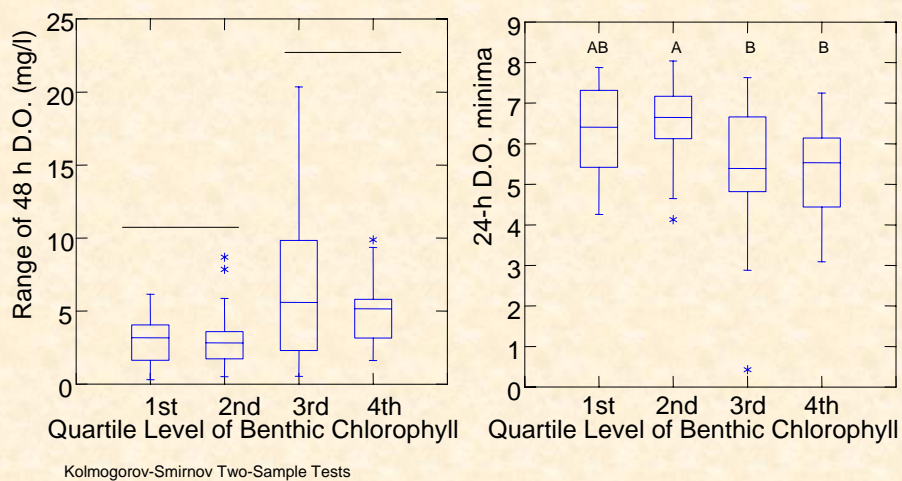
(i.e., nutrients loads follow an additive function)



Links Between Productivity and Biology Part I – Dissolved Oxygen

- Examine relationship between benthic chlorophyll and hourly dissolved oxygen
 - canopy, gradient
 - land use
 - nutrients

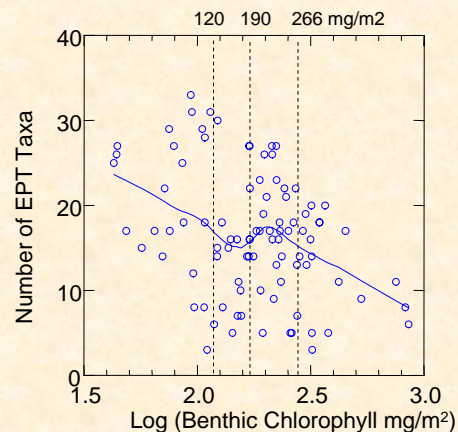
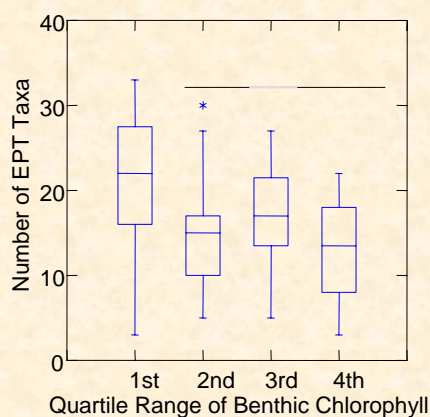
Categorical Levels of Benthic Chlorophyll and D.O. Flux and Minima



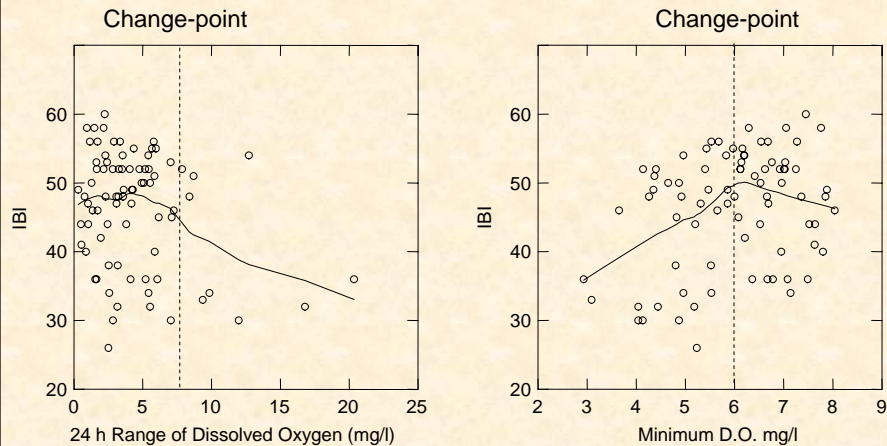
Links Between Productivity and Biology Part II – Macroinvertebrates and Fish

- Examine Relationships Between Chlorophyll, D.O. and Fish and Bugs
 - stimulatory effect of enrichment
 - changes in community composition
 - link between trophic levels
 - secondary effect due to D.O.

EPT Taxa and Benthic Chlorophyll Levels



Fish IBI Scores in Relation to Dissolved Oxygen – Trend Line Fitted by Locally Weighted Smoothing



Summary

- Positive relationship exists between nutrients and benthic chlorophyll concentrations
 - mediated by light or shading
- Stream productivity influences macroinvertebrate community structure
 - increased abundance of nutrient tolerant organisms
 - loss of sensitive taxa
 - detectable at low levels of enrichment
- Secondary effects of eutrophication through D.O. most consequential
 - manifested in loss of aquatic life use

Cause-Effect Matrix

Identifying Target Nutrient Concentrations

